



**National Transportation Safety Board
Office of Railroad, Pipeline and Hazardous Materials Investigations
Human Performance and Survival Factors Division
Washington, D.C. 20594**

HUMAN PERFORMANCE GROUP CHAIRMAN'S FACTUAL REPORT

A. ACCIDENT

NTSB Accident Number: DCA-17-FR-012
Date of Accident: August 22, 2017
Time of Accident: 12:11 a.m. (EST)
Type of Train and No: Single-car train 155 colliding with single-car train 148
Railroad Owner: SEPTA
Crew Members: 1 train operator
Location of Accident: Upper Darby, Pennsylvania

B. HUMAN PERFORMANCE GROUP

Group Chairman

Stephen M. Jenner, Ph.D.
Human Performance Investigator
National Transportation Safety Board

Group Members

George Good
FTA Accident Investigator

John Reynolds
SEPTA Senior Director Transportation

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SMART Investigator

C. SUMMARY OF THE ACCIDENT

For a summary of the accident, refer to the *Accident Summary Report* in the docket for this investigation.

D. DETAILS OF THE INVESTIGATION

1. Behavioral Factors

a. Sleep/Wake/Work Hours.

The operator of the accident single-car train provided investigators with a 72-hour work/rest routine. On Saturday, August 19, 2017, he was scheduled to work but took a sick day due to an episode with gout. He took medication for this condition, and remained at home much of the day. On Sunday, August 20, he woke up around 7:30 a.m., ate breakfast and ran. He stated that he was still experiencing some discomfort with gout, though his condition was improving. He went on duty at 4:37 p.m. and worked until 12:21 a.m. Monday. He then went home (about a 5-7-minute walk) and went to sleep shortly afterwards. He slept until about 8:00 a.m. Monday morning. He then ate breakfast and ran. He stated that his gout episode had ended. He went on duty at 2:22 p.m. and felt very alert at the start of his shift. He worked until the time of the accident (12:09 a.m.). Because of maintenance work and delays due to single tracking, he was on duty past his normally scheduled 12:00 a.m. off duty time. The operator's eight-day work history leading up to the accident is detailed in Table 1.

Table 1. Operator's eight-day work history

DATE	TIMES ON DUTY	TOTAL HOURS WORKED
Monday 8/14/17	2:22 p.m. – 12:00 a.m.	9 hrs. 38 min.
Tuesday 8/15	5:28 p.m. – 2:47 a.m. (see Ops)	9 hrs. 19 min.
Wednesday 8/16	2:24 p.m. – 11:22 p.m.	8 hrs. 58 min.
Thursday 8/17	7:00 p.m. – 3:00 a.m. (Scheduled day off; worked overtime)	8.0 hours
Friday 8/18	Day off (scheduled)	0.0 hours
Saturday 8/19	Sick day	0.0 hours
Sunday 8/20	4:37 p.m. – 12:21 a.m.	7 hrs. 44 min.
Monday 8/21	2:22 p.m. – 12:11 a.m. (accident)	9 hrs. 49 min.

2. Task Factors¹

a. Accident trip sequence.

¹ This section was developed from interviews with the operator and mechanical data recorder.

The operator made several uneventful trips prior to his last scheduled inbound trip. That night there were periods of heavy and light rain, with light precipitation falling during his inbound trip. He told investigators that it wasn't consistently slippery throughout the night, although he had experienced the train slide² on different occasions. He believed that his train was more likely to slide during periods of lighter rain. During the slipping incidents, he would try to drop sand to improve traction.

The operator departed Norristown Station about 11:32 p.m. and headed for 69th Street Station for his last inbound trip. While operating down a slight grade and slowing his train to stop at Gulph Mills Station, he experienced a wheel slip at 11:39:43 (brakes applied at B7) and another wheel slip at 11:39:52 (while emergency brakes were applied). He slid past Gulph Mills Station by 2 or 3 car lengths. (He told investigators he thought he slipped about one car length). He stated that he did not know it was slippery heading into Gulph Mills, and he slid farther than he had expected. Per operating procedures, he called the SEPTA Operations Control Center to report his situation, and received permission from the controller to back up his train to service the Gulph Mills Station. He successfully completed that maneuver. After he departed Gulph Mills Station, he experienced other instances where his train would "slip a little bit."

From Gulph Mills Station (departure time 12:43:19) until the time of the accident, the operator would typically operate his train about 5 mph slower than the Cab signal allowed, i.e., operating at 49 or 50 mph in a 55-mph zone.

Event recorder data indicates that between 12:07:42 – 12:08:30, the train experienced 11 wheel slips. The wheel slips occurred when the train was in throttle position P2 or P3. Wheel slips also occurred intermittently between 12:08:50 and the time of impact (12:09:37 a.m.) when the brake position was B7 or B8.

Table 2 lists relevant times, speed, master controller position (throttle or brake), and cab signal after the operator departed Parkview Station (the station immediately before 69th Street Transportation Center). During this sequence, the train slid past signals 2S and 4S (each displaying a *proceed* indication) and past Signal 6S (displaying a *Stop* indication). The engineer communicated to the passengers three times to brace themselves, and sounded the horn. The train continued sliding into the 69th Street Transportation Center and struck a standing, unoccupied single-car train.

Table 2.

TIME	SPEED	MASTER CONTROLLER POSITION	CAB SIGNAL
12:08:47	51	P1	55

² A spin-slide indicator illuminates on the operating control panel when the wheels slip or slide.

12:08:48	51	P3	55
12:08:51	54	B6	30
12:08:53	55	B6	30
12:08:54	54	B7	30
12:09:03	51	EMG	30
12:09:04	50	B7	30
12:09:08	48	B7	15
12:09:31	28	EMG	NOASPECT
12:09:37 (impact)	23	B7	NOASPECT

b. Cellular Phone Use.

The train operator indicated that during the accident trip, he had used his cell phone for operating purposes when his train was stopped to contact the controller at Gulph Mills Station. After that, he told investigators that he turned off and stowed his phone with his personal items. Investigators reviewed inward-facing videos of the operator during the accident trip and confirmed that he had not used his cell phone other than at Gulph Mills Station.

c. Weather/visibility.

The Philadelphia airport, located 5 miles south of the accident site, reported wind from the southwest at 7 mph, visibility of 10 miles, scattered clouds at 1,700 feet, and temperature 79-degrees F. The video from the train's forward-facing camera showed some light precipitation about the time of the accident. The operator indicated that he could see the signal aspects of the last three signals he passed before entering the platform of the 69th Street Transportation Center.

3. Medical Factors

a. Health.

The operator was a 41-year-old male. His SEPTA medical records contain a single medical examination report, on January 26, 2011. His vision for both eyes was 20/20, and his hearing was normal. He had also indicated that he had no sleep disorders. Following the accident, the operator told investigators that his overall health was good. He did not have any acute medical conditions, such as allergies or a cold. He had episodes of gout and takes prescription medication for it as necessary. Beyond that, he stated that he did not have chronic medical conditions. He had no history of black outs. Except for taking prescription medication for gout on an as-needed basis, he reported that he was not currently taking any prescription or non-prescription medications.

b. Post-accident toxicology tests.

In accordance with federal regulations regarding post-accident toxicological testing, the operator provided a urine specimen and took a breathalyzer test to test for the presence of drugs and alcohol, respectively. The urine specimen was collected at 5:12 a.m. (5 hrs. 3 minutes after accident). The results of the tests were negative for alcohol and drugs.

4. Operational Factors

a. Training/experience/disciplinary actions.

The operator began working for SEPTA on March 7, 2011. He started his training in bus service, and became qualified that year. In October 2011, he became qualified to operate rail cars on Norristown High Speed. During the last several months before the accident, he had been alternating working bus, trolley and rail cars.

The operator's performance records included some minor incidents that had occurred while he was operating a bus. None of these incidents resulted in disciplinary actions. His records also detailed two incidents that occurred while he was operating a train. On October 3, 2014, he had a signal (rule) violation for "accepting a signal for a wrong route" after he departed the yard. As a result, he was issued a 5-day unpaid suspension. One August 7, 2017, he had operated a train over a switch that had mistakenly been thrown to reverse by the control center. He was not disciplined for this incident.

b. Overview of SEPTA's training program.

Trainees must be a qualified as a bus operator before they can start training for rail operations. The typical class size for rail operations is typically 2 or 3 people. Trainees are trained in several areas including rules, vehicle familiarity, mechanical trouble shooting, and familiarization with the line where they'll be operating. During this process, trainees must pass a series of quizzes and a final examination. This phase of training lasts 20 days if there are 2 students in the class, and 25 days when there are 3 students. The training process also includes normal passenger operations under the supervision of an instruction. Later, trainees will be assigned a mentor, who is an experienced operator available to answer any questions or provide assistance after the trainee becomes qualified.

Operators are not provided precise instructions for operating in different weather conditions, although the chief instructor believes that operators need to change their operating methods depending on the conditions. He suggested that conditions are different if precipitation began recently as opposed to several hours earlier. He also stated that operators also need to consider the track grade (i.e., flat surface versus operating downhill) in their operating strategies.

c. Chief Instructor at SEPTA

SEPTA's Chief Instructor started with SEPTA in 1986 as a bus operator and worked in that capacity for 10 years. In March 1996, he became a transit instructor, and in 2000, a suburban light rail instructor. He served as a light rail instructor until October 2016 when he became the Chief Instructor. In his current position, he assigns the work for instructors that operate or train at

Victory District on Media-Sharon Hill, Norristown and Elmwood Rail and Callowhill Rail. He also develops lesson plans, monitors tests and develop tests that operators take for their certification and annual recertification.

d. Light Rail Controller

The Light Rail Controller, who was working the Norristown Line when the accident occurred, had been in her position since February 1995. That evening she reported for work at 10 p.m. and was scheduled to work until 6 a.m. the next morning. While on duty she is responsible for subway surface light rail, Suburban light rail and the Norristown High Speed Line. On the night of the accident she was responsible for single track operation (STO) between Bryn Mawr and West Overbrook. She indicated that her workload that night was busier than normal but not overwhelming.

During her shift, the operator of the accident train had called her asking for permission to back up his train at Gulph Mills Station after his train slid past the station. She approved that maneuver. That was the only call she had received from any operator prior to the accident indicating that their train had experienced sliding. She told investigators that if she had received multiple calls she would have sent an alert to the operators informing them of the slippery rail conditions. She was not aware of a signal violation until she was notified by a manager.

Compiled by: /s/_____

Date: November 15, 2017

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